

OPEN-OUT MECHANISMTECHNICAL FIELD

The invention relates to an open-out mechanism which is intended for windows which can be opened out as a whole unit and which has at least four open-out scissors-type arrangements which act on the window sash and are fastened on the window frame, and also has a drive and a locking means.

PRIOR ART

Open-out scissors-type arrangements for horizontally supported roof-light openers are known, for example, from DE 36 22 943 A1. In this document, the scissors-type arrangement has a short control lever and a longer open-out lever, there being provided in the short control lever a cam curve which is responsible for an open-out displacement and a locking displacement. Said scissors-type arrangement requires an additional compensating link between the open-out lever and the window frame.

A similar configuration is known from DE Patent 21 38 101. In this case, however, the open-out lever engages in a slotted fitting of the window sash.

Furthermore, CH 385 066 discloses an actuating device for windows or doors which can pivot and/or tilt. In this document, the scissors-type arrangement comprises an open-out lever, which is articulated displaceably on the window frame and fixedly on the window sash, and a control lever, which is articulated displaceably on the window sash and on the open-out lever. The control lever also has a cam curve, the latter producing, in conjunction with the mounting of the control lever, an open-out displacement and a locking displacement.

Moreover, GB 449,761 describes an open-out mechanism for windows which can be opened out as a whole unit. This open-out mechanism has four open-out arms, of which in each case two are coupled via actuating levers. The open-out arms are articulated fixedly both on the

window sash and on the window frame.

DESCRIPTION OF THE INVENTION

5 The object of the present invention is to develop an open-out mechanism of the type mentioned in the introduction so as to achieve, with straightforward design means and while maintaining satisfactory functioning and low costs, a largely parallel and rectilinear open-out movement of the window sash relative to the window frame.

10 This object is achieved according to the invention by the combination of features in Claim 1.

Consequently, open-out scissors-type arrangements, inter alia, are provided according to the invention. Open-out scissors-type arrangements are to be
15 understood as levers which are coupled rotatably to one another, it being possible for the levers to be coupled to one another such that, in the spread-apart position, they assume the form of a Y or of an X. The capacity of said coupling for rotational movement is thus such that
20 the movement of the open-out scissors-type arrangements takes place essentially in the same plane. A significant feature of the solution according to the invention is constituted by the different mountings of the various elements of the open-out mechanism according to the
25 invention, the difference being in terms of the degrees of freedom which the respective mounting permits. Thus, in addition to the capacity for rotational movement, an at least rotatable mounting, in some circumstances, provides further degrees of freedom. A displaceable
30 mounting is distinguished in that the bearing point is displaced upon actuation of the open-out mechanism. The solution according to the invention advantageously provides that, when it moves for opening and closing purposes, the window sash describes a path which is
35 rectilinear and at right angles to the plane of the window frame, and the window sash is coplanar with the window frame at any point in time of this movement. At the same time, it is ensured that the window sash is

fixed in the position at all times in the partially open state and fully open state. Unintentional displacement of the window sash in its plane is ruled out.

Advantageously, the open-out mechanism is provided with open-out scissors-type arrangements of Y-form and the displaceable mounting of the open-out lever is located on the window frame. It is advantageous that the mounting which takes up more space is arranged on the window frame, with the result that the window sashes can be produced in a more straightforward manner and with reduced weight.

This advantage is likewise obtained with the X-arrangement according to Subclaims 5 and 6. Moreover, the X-arrangement in fact enhances the positional stability of the window sash with respect to loading in its plane.

In order to achieve further-improved sealing of the window and to provide an additional safeguard against break-in, the drive lever is mounted rotatably on the open-out lever and rotatably and displaceably in a drive rail. This mounting permits a change in position between the drive lever and open-out lever, with the result that the open-out lever can be secured by the drive lever.

In order further to improve a space-saving and reduced-weight design of the window sash, the invention provides that the rotatable bearing point of the drive lever on the open-out lever is arranged between the mounting of the open-out lever on the window frame and the rotatable coupling of the open-out lever and control lever. This advantageously permits the bearing point of the drive lever to shift in the direction of the window frame. A concealed drive, i.e. one which cannot be seen from the outside or through the partially opened window, is thus advantageously made possible as well.

In order to optimize the relative forces between possible forcing of the window and the drive mechanism, it is provided that the drive lever moves, from the opened-out position of the window sash to the closed position of the window sash, from a first position into a second position, the second position being a dead-

centre position, in which it is not possible for any forces to be transmitted via the drive lever, from the window sash to the drive, in the drive-actuating direction. As a result, opening of the window sash without
5 actuation of the open-out mechanism is prevented.

According to a further advantageous development of the invention, further-improved locking of the window sash and window frame is ensured in that, distributed as uniformly as possible around the periphery of the window
10 sash, in combination with the open-out scissors-type arrangements, at least one curved guide is provided and at least one corresponding pin is provided on the drive, it being the case that, upon actuation of the drive, the pin engages in the curved guide and locks the window sash
15 relative to the window frame. This development makes it possible, with continued sealed closure of the window sash, for the open-out scissors-type arrangements according to the invention to be arranged even more closely to one another than would be possible without the curved
20 guide.

The drive lever and/or control lever are advantageously mounted in receiving means which can be changed in position. This can be realized, for example, by a plurality of spaced-apart receiving points or by
25 displaceable receiving means. This advantageous development makes it possible for the maximum extent to which the window sash can be opened out to be adjusted as desired without the design of the open-out mechanism according to the invention having to be modified in any
30 way.

According to a further advantageous development of the invention, the actuation of the open-out mechanism is based on secondary energy, e.g. electricity. Driving by electric motors thus also permits remote control of
35 the open-out mechanism. Open-out windows with an open-out mechanism according to the invention may thus also be used in regions which are barely accessible, if at all.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments are described and set out hereinbelow, in order further to explain and better to clarify the invention, with reference to the attached drawings, in which:

- Fig. 1 shows a schematic view of an open-out window with schematically indicated open-out scissors-type arrangements and driving linkage with motor;
- Fig. 2 shows a side view of the window frame and window sash in the closed position and in the opened-out position, the closed position being illustrated by chain-dotted lines and the opened-out position being illustrated by solid lines;
- Fig. 3 shows an enlarged detail of Fig. 2, the detail illustrating an open-out scissors-type arrangement of Y-form according to a first embodiment of the invention, chain-dotted lines showing the closed position and solid lines showing the opened-out position;
- Fig. 4 shows a detail comparable to that of Fig. 3, the detail illustrating a scissors-type arrangement of X-form according to a second exemplary embodiment of the invention, this particular arrangement being shown in a perspective view and in the opened-out position;
- Fig. 5 shows a further detail of Fig. 2, which illustrates, in particular, the curved guide of the window sash; and
- Fig. 6 shows a further detail of Fig. 2, which illustrates, in particular, the curved guide of the window sash in the closed state together with the drive pin engaging in it.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

- An open-out window 10, which is illustrated in Fig. 1, essentially comprises a window sash 12 and a window frame 14. The window frame 14 and the window sash 12 are connected via four schematically indicated open-out scissors-type arrangements 16, which are actuated via

a drive in the form of connecting rods 18 and a drive motor 20. The drive motor 20 is preferably an electric motor and simultaneously actuates the connecting rods on both sides of the window sash. Since a single drive motor
5 is provided centrally on the narrow side of the window 10, the connecting rod is provided with a deflecting means 22. The drive moves the connecting rods 18 in their longitudinal directions. As corner deflecting means, use is preferably made of bevel wheels (not illustrated), and
10 the rotational movement is converted into linear movement via a spindle.

Fig. 2 shows the window sash in its closed position and in its opened-out position, two of the four open-out scissors-type arrangements 16 being illustrated.
15 The opened-out position is illustrated by solid lines on the right-hand side of the figure, and the closed position is illustrated by chain-dotted lines on the left-hand side of the figure. Details of the open-out scissors-type arrangement 16 are described specifically at a
20 later stage in the text with reference to Fig. 3. Fig. 2 also shows that the open-out scissors-type arrangement 16 mainly comprises an open-out lever 24, which is essentially designed as a rectilinear rod, and a control lever 26. The control lever is likewise designed as an essentially
25 rectilinear rod, but is shorter than the open-out lever 24. The two levers 24, 26 are located essentially in one plane, perpendicular with respect to the plane of the frame and essentially parallel to the side surface of the window sash 12. The window sash 12 is additionally
30 provided with a curved guide rail 46, which serves for locking the window sash relative to the window frame. The window-sash-mounted receiving means 50, 44 of the control lever 26 and open-out lever 24 are preferably arranged not just in one plane, but also on one line. Furthermore,
35 the connecting rod 18 is preferably located essentially in the same plane as the open-out scissors-type arrangements. This configuration is preferred for both embodiments, these two embodiments being illustrated in detail in Fig. 3 and Fig. 4.

Fig. 3 shows details of a first embodiment of the open-out scissors-type arrangement 16, as follows. The control lever 26 is mounted rotatably, by way of one end 28, in a receiving means 50 via a pivot pin 30. The receiving means 50 is fixed on the window frame (not illustrated in the figure). It has a plurality of spaced-apart, possible fastening means for the pivot pin 30, with the result that it is possible to adjust the maximum width to which the window can be opened out. By way of its other end 32, the short control lever is fixed rotatably in a central region of the longer open-out lever 24 via a pivot pin 34.

The open-out lever 24 is mounted rotatably, by way of one end 36, in a receiving means 50 via a pivot pin 38. The receiving means 50, in turn, is fixed on the window sash (not illustrated). In the same way as the window-frame-mounted receiving means, the window-sash-mounted receiving means is also provided with a plurality of possible, spaced-apart receiving means for the pivot pin 38. The other end 40 of the longer open-out lever 24 is fixed rotatably on the frame via a pivot pin 42, albeit such that said pivot pin 42 is mounted as a pin on a slide 44, in such a manner that, together with the slide 44, it is guided movably in a linear guide (not illustrated specifically) in the plane of the frame and essentially parallel to the extent of the connecting rod 18.

On the longer open-out lever 24, a drive lever 62 is mounted rotatably in a pivot pin 66, between the pivot pin 34 for the shorter control lever 26 and the pivot pin 42 of the open-out lever. By way of its other end, the drive lever 62 is fastened rotatably on a slide 60 via a pivot pin 64. The slide 60, in turn, is connected to the connecting rod 18. In Fig. 3, the slide 60 and drive lever 62 are illustrated in the opened-out position of the window by virtue of both solid lines (for visible edges) and broken lines (for edges which cannot be seen). On account of the arrangement of the control lever and open-out lever relative to one another - in the opened-

out position of the window sash - the embodiment which is illustrated in detail in Fig. 3 is generally referred to as a Y-arrangement.

Fig. 4 shows a perspective view of a further embodiment of the present invention, this embodiment generally being referred to as an X-arrangement, as can be seen from the illustration. This X-arrangement likewise comprises an open-out lever 124, which is mounted rotatably, by way of one end 140, on a slide 144 via a pivot pin 142, with the result that said end can be displaced. This end, which is generally arranged on the window frame, is received in a rail 152 fastened on the window frame. The other end 136 of the open-out lever 124 is generally fastened, via a pivot pin 138, on the window sash.

Just as the first embodiment, this embodiment is likewise provided with a control lever 126, although the latter is designed to be essentially the same length as the open-out lever 124. At one end 128, the control lever 126 is received rotatably and displaceably in a further rail 152 via a pivot pin 130. At its other end 132, the control lever 126 is fastened on a receiving means 150 via a pivot pin 134. In the same way as the embodiment described with reference to Fig. 3, the receiving means 150 and the slide 144 are provided with a plurality of spaced-apart fastening points for the respective pivot pins, with the result that it is possible to pre-adjust the maximum width to which the window sash can be opened out.

Fig. 4 likewise illustrates the connecting rod 118 and the drive lever 162. The latter is fastened, at one end, on a slide 160 via a pivot pin 164, said slide, in turn, being coupled to the connecting rod 118. By way of the other end, the drive lever 162 is fixed on the open-out lever 124 via a pivot pin 166. In the case of both embodiments illustrated (Fig. 3 and Fig. 4), the actuation of the open-out mechanism takes place via the connecting rods 18, 118 in the driving direction, which is illustrated by double arrows A.

The open-out mechanism of both embodiments described is provided with an additional locking unit 51 (see Figs. 2, 5 and 6). This locking unit 51 essentially comprises a curve guide 46, which is fastened on the window sash 12, and a pin 48, which is fitted on the connecting rods 18, 118. Upon actuation of the connecting rods in the closing direction (arrow A in Fig. 6), the pin 48 likewise moves gradually in the closing direction. The closure of the open-out window causes the curved guide 46, together with the window sash 12, to approach the pin 48 simultaneously, at right angles to the actuating direction of the connecting rod 18, 118. These two movements are coordinated such that the pin 48 engages precisely in the curved guide 46 and, when the window sash 12 is fully closed, is located in that part of the curved guide 46 which is formed in the actuating direction of the connecting rod. The positive locking between the pin 48 and curved guide 46, and the formation of the curved guide 46 parallel to the window frame 14 in this region, thus prevent it from being possible, when the window sash 12 is in the closed state, for said sash to be lifted away from the window frame 14 by the exertion of force from the inside or outside.

The relative sizes in the drawings are to be understood, for example, such that the distance between the pivot pins 38 and 42 is approximately 400 mm. Otherwise, the specific design in terms of dimensions can be gathered, in particular, from Fig. 3. The distances between the bearing points of the control lever 26, 126 and open-out lever 24, 124 relative to one another, in conjunction with the individual lever lengths, are generally selected, in the same way as said relative sizes, such that it is possible to achieve a rectilinear open-out movement at right angles to the plane of the window frame 14, the plane of the window sash 12 always being located parallel to the plane of the window frame 14.

The actuation of the open-out mechanism will be explained hereinbelow, first of all with reference to Fig. 3. The exemplary embodiment which is illustrated in

Fig. 4 is actuated analogously, so the latter exemplary embodiment will not be explained in detail in this respect.

5 The introduction of force for actuating the open-out mechanism is effected via the connecting rod 18 in the actuating direction A. The connecting rod 18 moves the slide 60, on which the drive lever 62 is mounted via the pivot pin 64. In Fig. 3, this takes place, for the purpose of closing the window, from top to bottom, i.e.
10 from the position which is shown in solid lines into the position at which it is illustrated in chain-dotted lines.

By virtue of the control lever 26 being mounted rotatably, but non-displaceably at its end 28, the
15 control lever 26 is forced to move on a circular path about the pivot pin 30. Similarly, the open-out lever 24 describes a circular path about the pivot pin 38, although the position of the pivot pin 38 changes gradually when the window sash changes its position. The
20 other end of the open-out lever 24 is mounted displaceably via the pivot pin 42, although this pivot pin cannot leave the plane which is predetermined by its guide. Relative to the open-out lever 24, the drive lever 62 describes a circular path about the pivot pin 66. At the
25 same time, the drive lever 62 is connected to the slide 60, and thus also to the connecting rod 18, via the pivot pin 64. This type of mounting means that although the position of the pivot pin 64 can shift - from top to bottom in the figure - it is not possible to have a
30 change in the plane of movement relative to the plane of the window frame.

Upon actuation of the connecting rod 18 in the closing direction, force is thus introduced into the open-out lever 24 via the slide 60, the drive lever 62
35 and the pivot pin 66. The pivot pin 66 moves vertically downwards - this direction-related information and that which follows relates to the illustration in the figure - and forces the end 40 of the open-out lever 24 to execute the same movement, although at a different speed.

The control lever 26 moves to the left on its circular path. During the closing movement, the drive lever 62 simultaneously rotates to the right about the pivot pin 66. On account of the relative lengths between the control lever 26 and open-out lever 24 and by virtue of a suitable selection of the distances between the respective bearing points, the end 36 of the open-out lever 24 describes a rectilinear movement - from right to left in the figure - with the result that the window sash is located at all times, and closed, in a manner coplanar with the window frame.

When the window is fully closed, the drive lever 62 is located in a dead-centre position. This ensures that if the window sash is forced, e.g. in the event of break-in attempts or wind suction, there is no force produced in the open-out mechanism or the connecting rod which results in an opening movement of the open-out mechanism.

In the case of the exemplary embodiment illustrated, the dead-centre position is such that a forcing action of this kind would result in the drive lever 62 being subjected to a force which acts precisely at right angles to the guide of the slide 44. There is thus no force component in the actuating direction.

PATENT CLAIMS

1. Open-out mechanism for open-out windows with a window sash (12) and a window frame (14), the open-out mechanism comprising:

- 5 - at least four open-out scissors-type arrangements (16) which act on the window sash and are fastened on the window frame, the open-out scissors-type arrangements having an open-out lever (24, 124) and a control lever (26, 126), which are each arranged
10 essentially in one plane, and
- a drive (18, 118) for actuating the open-out mechanism,

characterized in that

- the open-out lever connects the window sash and
15 window frame to one another and is mounted rotatably at a first end (36, 136) and rotatably and displaceably at a second end (40, 140),
- the control lever is coupled rotatably to the open-out lever and, at a first end (28, 128), is
20 connected at least rotatably to the window frame, and
- the open-out scissors-type arrangements (16) are coupled rotatably to a drive lever (62, 162), by means of which the open-out scissors-type
25 arrangement can be driven and locked.

2. Open-out mechanism according to Claim 1, characterized in that the drive lever is coupled rotatably to the open-out lever (24, 124).

3. Open-out mechanism according to at least one of
30 Claims 1 and 2, characterized in that the rotatable coupling (34) between the control lever and open-out lever is provided at a second end (32) of the control lever.

4. Open-out mechanism according to at least one of
35 the preceding claims, characterized in that the open-out lever (24, 124) is mounted rotatably on the window sash (12) and rotatably and displaceably on the window frame (14), and the control lever (26, 126) is mounted rotatably on the window frame (14) and on the open-out lever





(24, 124).

5. Open-out mechanism according to Claim 1, characterized in that the rotatable coupling (134) between the control lever and open-out lever is provided in a central region of the control lever (126), a first end (128) and
5 a second end (132) of the control lever being mounted rotatably and displaceably.

6. Open-out mechanism according to Claim 5, characterized in that the open-out lever (124) is mounted
10 rotatably on the window sash (12) and rotatably and displaceably on the window frame (14).

7. Open-out mechanism according to at least one of the preceding claims, characterized in that the drive lever (62, 162) is mounted rotatably on the open-out
15 lever (24, 124) and rotatably and displaceably in a drive rail (52, 152).

8. Open-out mechanism according to at least one of Claims 2 to 7, characterized in that the rotatable coupling (66, 166) of the drive lever and open-out lever
20 is arranged between the mounting (42, 142) of the open-out lever on the window frame and the rotatable coupling (34, 134) of the open-out lever and control lever.

9. Open-out mechanism according to at least one of the preceding claims, characterized in that the drive
25 lever (62, 162) moves, from the opened-out position of the window sash to the closed position of the window sash, from a first position into a second position, the second position being a dead-centre position, in which it is not possible for any forces to be transmitted via the
30 drive lever, from the window sash to the drive, in the drive-actuating direction.

10. Open-out mechanism according to at least one of the preceding claims, characterized in that, furthermore, the open-out mechanism has at least one curved guide (46)
35 on the window sash and at least one corresponding pin (48) on the drive, it being the case that, upon actuation of the drive in the closing direction, the pin engages in the curved guide and locks the window sash relative to the window frame.

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11. Open-out mechanism according to at least one of the preceding claims, characterized in that provided on the window sash and/or on the window frame are changeable-position receiving means (50, 150) for the rotatable mounting of the open-out lever and/or of the control lever.
12. Open-out window with an open-out mechanism according to at least one of the preceding claims.

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